

# Estimate of resources required for a meaningful reform of education

Stanisław D. Głazek

(Dated: v1 31 Jan 2007; v2 16 Oct 2010; v3 1 Jul 2012; v4 23 Nov 2012)

A simple estimate in terms of currency units shows that a meaningful educational reform process can be launched and sustained over many generations of teachers with support of parents of students. In the estimate, the steady inflow of resources from parents provides support for advanced studies by teachers. Not to waste the resources on spurious activities, the estimated inflow proceeds directly from the parents as clients to the providers of required reform program. The providers are the experts in various disciplines who excel in helping teachers become great. Their services to teachers are ultimately assessed by parents on the basis of changes in behavior of children. The resulting reform program grows slowly from small seeds. The running cost of the reform process to parents appears surprisingly low while its development leads to the desired changes over time.

## I. INTRODUCTION

Ongoing discussions and practices of educational reform movements reflect a variety of ideas and many conflicting interests. The net result is not satisfactory. Students do not learn what they are said to be taught. The worst thing is, however, that the acute problems with facilitation of learning continue to grow at all levels of society and lead to social disparities and unrest instead of being gradually solved as they appear.

Among many, the key reason for this result is that reform efforts are typically *not* centered on the people who learn and teach. Most reform efforts do *not* take seriously how students and teachers see themselves and how they imagine their own future. Instead, typical reform programs appear tuned predominantly to what the reformers are interested in achieving, irrespective of the states of mind of students and teachers. Thus, the students and teachers do not have any deeply vested interest in engaging in typical reforms. The reforms are not “theirs” and it is natural for them not to engage every year in another “reform” administered from above. It is more economic for them personally to ignore such fads.

Consequently, the changes that reformers promise when they advertise their reform projects do not occur. Instead, the vagaries of reform continue and fail to create a qualitatively new system that would guarantee *by design* that the majority of alumni are competent learners with a sizable probability of achieving satisfaction in life. The educational system is stuck in such vagaries of reform for a long time, at least an order of magnitude longer than the average duration of employment of an average teacher. To get out of this cycle of reform failure, the system needs a sufficiently strong force of change to start working in it and never stop.

The leading hypothesis of the estimate described here is that if teachers take initiative in their hands and become co-authors of the reform program with support of parents, the program has a chance to develop over sufficiently many generations for the desired, qualitative change to eventually happen. The estimate suggests that parental financing of the reasonable reform program is realistic.

## A. Foundation

In the estimate, the process of preparation that teachers can consciously engage in for eventually becoming great is based on deliberate practice of learning in the context of life, work, and disciplines in which teachers specialize. Such successful preparation is an example of learning that we call productive. Productive learning by teachers leads them to the concept of productive teaching. This means that students learn productively in the contexts of their lives and take advantage of and develop their strengths as they study relevant disciplines coached by their teachers.

On the basis of an assumption that a new educational system will develop as a result of productive teaching, it is assumed in the estimate that the new system will be gradually formed in a process of one generation of teachers learning from another. This process is seen as analogous to the long-term natural evolution of species, except that humans are capable of adding some conscious action to the unconscious ways of Nature. Thus, *the main idea underlying the estimate is that the natural learning mechanisms in parents, students, teachers, and experts of all disciplines can be engaged in building the new system.*

Since productive learning occurs when one generation successfully learns from another, the ultimate providers of resources for teaching new generations are their parents. *Reform program will be steadily supported by parents if and only if it facilitates productive learning by children. Such facilitation requires that teachers 1) consciously learn according to their wants, needs and abilities coached by successful experts in the disciplines they specialize in and 2) become independent developers of their own expertise on productive teaching as the signature of their profession. The role of parents is to support teachers in creating, sustaining, and participating in both these processes.*

This note estimates the order of magnitude of the costs of a reform process that parents would have to cover on regular basis. For productive teaching to become a commonplace, it is necessary that conscious facilitation of productive learning by teachers occurs over sufficiently many generations to become a systemic principle: a fea-

ture and a paradigm. Certainly more than two generations must be involved for more than just one generation of teachers to learn from another what it takes to become a great teacher.

The condition of more than two generations being involved implies a period on the order of at least half a century. Such a time scale does not lie within the time horizons considered in typical reform programs.

The estimate of required resources is provided here in terms of currency units. The resulting numbers suggest that launching and sustaining a meaningful reform process is not as unrealistic as one might expect on the basis of experience with failure of reforms that are not systematically supported by more than one generation of parents and thus do not involve teachers as professionals who systematically improve their performance generation after generation.

### B. Key problem and the way around it

Among many problems that need to be solved in order to develop a meaningful reform as indicated above, the central one is the need for a clear definition of what is meant by productive learning. No such clear definition is explicitly shared by all members of society. In particular, no such concept is currently shared by the reformers, teachers, students, and parents; certainly not to a degree of clarity that could even remotely compare with, for example, the degree of clarity of the concept of flying on an airplane that is shared among the aviation industry and their clients.

It is thus imperative that the estimate described in this note appears sufficiently motivating for at least some participants in a current system so that they can start contributing to a buildup of a reasonable reform process even if the society at large does not yet clearly define and commonly share any overarching concepts of productive learning and teaching. So, let the underlying principle be described in terms of the following four points:

1. The only long-term providers of resources for a meaningful educational reform are the parents of students;
2. The only way parents can significantly contribute to the improvement of educational regularities is to provide support for advanced studies by teachers;
3. Teachers need extensive studies and cooperation with scientists, artists and professionals in order to become able to help students actively prepare for successful functioning in society according to their strengths and learning skills;
4. Current educational systems in general do not offer opportunities for the required studies and cooperation as fundamental systemic features.

None of these points explains what constitutes productive learning and teaching in any operational form. Nevertheless, one can assume that some parents understand these points sufficiently, even if only intuitively (see below), to support the process of helping teachers to become great. These parents could become the initial providers of support needed for launching the process of meaningful reform.

If a suitable organization of teachers existed, all parents could be offered opportunities to provide their support for advanced studies by teachers. However, only a subgroup of parents who are lucky enough to get motivated by teachers of their children have a chance to act before the society commonly agrees on what constitutes productive learning, how productive teaching serves the purpose, and how large the cumulative magnitude of gradual changes will be accomplished during the next 100 or 1000 years. Therefore, the principles of productive learning and teaching that underlie the advanced studies by teachers can only gradually be implemented in practice based on a gradual increase of parental support. Such gradual increase of support may stimulate building of a new educational system before a broad consensus about the meaning of productive learning and teaching is achieved.

That the underlying principles may work this way around the current lack of shared concepts of productive learning and teaching is suggested by analogy with the fact that there is no hard evidence of any plan on the part of Mother Nature to produce mankind step by step in terms of small changes that occur generation after generation and yet mankind exists and excels among animals as a result of evolving from generation to generation by small steps. The crux of this note is that one can adopt the step by step strategy for reforming education.

The idea of reform action that is formulated here in terms of the estimate of resources can be pondered about in terms of the question “How?” instead of “What?” The word “How” refers to the method while the word “What” refers to the content of what is taught. Over time, relatively quick changes occur in “What” because civilization changes relatively quickly on Darwinian scale of time. But “How” people learn is unlikely to significantly change over a millennium. From the point of view of the crux of this note, changes in technology, such as from a stick on sand to ink on paper to computer display to telecommunication, are very important but they only concern the ongoing change of tools. The teaching process, in contrast, continuously creates and changes a living person. No chisel and hammer can properly work for this purpose in the hands of a school employee who has not personally lived through a process of productive learning and has no examples to follow in developing knowledge and skills required in productive teaching. Students need teachers who know and understand the mechanisms of how a living person truly learns. These mechanisms are not changing quickly on Darwinian scale of time, irrespective of the technological advances.

### C. Reservations

Whereas this note does not itself refer to a lot of empirical evidence, the author has arrived at the ideas described here on the basis of studies conducted with the participation of students and teachers and a lot of discussions with experts. This note follows three earlier documents that contain lists of some relevant sources. The earlier documents can be treated as supporting material to this note. The first is the article *The Living Network of Schools Owned by Teachers and Students* from 1998 [1]. It exhibited a great enthusiasm for the idea that understanding of one thing leads to understanding of another and eventually one can overcome all hurdles. In the years since then, the author has lived through several periods of renewed enthusiasm and despair regarding educational reform. Two outcomes of this struggle are Ref. [2] from 2006, and Ref. [3] from 2008.

### D. Outline of next sections

Section II describes a common problem of funding that planners of educational reforms face when they realize that their reform plan may not come true.

On this background, Sec. III discusses some issues that matter to the idea of parents providing support for advanced studies by teachers in collaboration with experts. The discussion includes the following issues: why would teachers want to work with experts, Sec. III A; could parents decide to pay for help of experts, Sec. III B; could parents currently buy learning for their children on regular basis, Sec. III C; are they satisfied with the status quo, Sec. III D; what can parents do about it, Sec. III E; whom can they pay for help, Sec. III F; is learning an element of common curricula, Sec. III G; how much parents can pay, Sec. III H; how students can contribute, Sec. III I; how parents can avoid wasting money, Sec. III J; and, the need for small trials, Sec. III K.

Subsequently, Sec. IV describes an approximate calculation of the support that a society can naturally provide for development of a self-improving and growing network of professional teachers. The calculation involves the following elements: initial assumptions used in the estimate, Sec. IV A; the role of informing parents about the project, Sec. IV B; estimate of the funds realistically available for advanced studies by one teacher for a year, Sec. IV C; the concept of a Teachers Center, or TC, to which the tuition accumulated for a teacher by parents is paid, Sec. IV D; statement of the goal of TC, Sec. IV E; crunching numbers to estimate parental and other funds that can be made available for running a TC, Sec. IV F; estimate of productivity of TCs, Sec. IV G; estimate of funds per employee of a TC, Sec. IV H; estimate of the workload of a TC, Sec. IV I.

After it is estimated that parents are able to provide enough resources for a TC to exist, Sec. V discusses main issues concerning formation of a TC. The following issues

are discussed: the role of a TC director as its founding leader and future employee, Sec. V A; after-school programs as laboratories where teachers and experts can carry out educational experiments with participation of students, Sec. V B; the role of initiative being in the hands of teachers, Sec. V C; self-selection of founders, Sec. V E; the new role to play by experts in pedagogy and andragogy, Sec. V D; location and operation of a TC, Sec. V F; summary of where the promise of the future for a TC comes from, Sec. V G; examples of suggestions for the initial action by founders of a TC, Sec. V H.

Section VI speaks briefly about an international organization that could perform the function of a brain in the network of TCs.

The concluding Sec. VII warns readers about serious opposition that both the idea of and attempts to create a new, global educational system with its own brain is likely to encounter.

## II. THE REFORMERS FUNDING DREAM

Consider the example of Ref. [1] in which a vision of a new educational system is sketched freely. The system is described as “powered at all levels equally by the will of students to learn and the will of teachers to learn and share their expertise with students.” The author wished that such system is created. The dream was that all one needs to do is to communicate with the people who are interested in creating the system and, as a result of shared understanding of the system concept, get to work together. Some of that has actually happened in the form of a small-scale project. However, the results were different than intended. The author had to abandon illusions, focus on unlearning, and start thinking from scratch about how Mother Nature could actually produce humans as the most advanced learning creatures on earth and how She continues to secure that humans apparently accelerate in learning.

The small project mentioned above is used here to illustrate how the problem of a lack of sufficient support surprises reformers even if they are able to convince themselves that they know what matters and proceed accordingly. Precisely in this spirit, the project was conceived in advance to sustain itself and grow thanks to the high quality of science education it would provide to teachers and thus to their students. The quality was to follow from the competence of people who carry out the project. An entire system was supposed to grow out of the initial activity because of its sound rules and noble goals. The financial aspects were carefully managed and nothing could happen without support coming from those who were served by the project.

The project certainly appeared as aiming at improving teaching. But the numbers of participating students and teachers were too small to secure funding of its growth. The instructors could not always volunteer or work full-time because they had to support their families while the

long-term prospects of earning a living were tangible only within the existing system, i.e., *not* within a small, new enterprise that could be shuttered at any time. It was not clear to the team who might be the key providers of support for a system of serious learning by teachers, for what reasons and purposes. In any case, the dream system could not sprout from their small seed without committed external help, i.e., investment.

Therefore, the team prepared a proposal to a major foundation in which it requested funding for a detailed plan of development based on the experience accumulated in the pilot project [4]. Again, the central assumption was that after some time the fledgling little system would get on its feet and begin stable growth. The funding would expire but the system was meant to be designed well enough to become capable of sustaining itself by providing services that teachers truly need for learning how to serve their students effectively. It was still not clear where from the teachers would obtain support to pay for the services they would receive. It was subconsciously assumed that somehow the existing system would become interested in purchasing the project services.

The above scenario is an example of the reformers' dream that assumes that what the reform effort intends to achieve in a thought-through fashion is so good that there is no way the program is going to die once it is given a chance to unfold its true potential. The belief behind such thinking is analogous to the dream that parents have when they tend for their child and imagine that the child will succeed in the future if only they provide the opportunity.

Reformers face the fact that their reform programs will die without funding. Some reformers learn to excel in continuously securing and managing new funds for continuing the work they believe worth continuation. However, obtaining funds is not synonymous with productive learning and teaching. Neither funding nor inflow of other resources is the whole story. The question is why the resources flow in and why they are expected to continue to flow in. A reform program has a chance for initiating a process of qualitative change to a new level of educational practice if it recognizes the features and benefits of productive learning and teaching and if it involves the corresponding systemic mechanisms through which the beneficiaries pay for functioning of the program.

Such clear mechanisms of support are needed in the educational change program not only to sustain it physically but also to make it attractive and promising mentally. People need to see that what they can contribute by joining the program may pay back in ways not limited to financial income. They need to see that they will have a chance to grow as persons if they contribute. People want to become – come closer to – who they want to be and who they think they can be. This is why they want to learn. One may suspect that their brains subconsciously respond to the bio-physical tension accumulated somewhere in their tightly folded genetic codes that are ready

to unfold in suitable conditions (no precise scientific evidence for such simple interpretation of human condition is known to the author). To attract new individuals to a long-term educational project, not only the inflow of resources must be realistically imaginable but also the goals as such must be attractive.

In summary, what ultimately counts when people assess the odds of success of “a great reform idea” and when they decide about joining the effort are the outlook for survival and growth of the project and the quality of reasons for the outlook to be good. Obtaining some form of temporary funding for a reform of education is not a key to lasting change. Instead, the key appears to be the clear mechanism that can secure the project survival and growth over long time. Such mechanism is, essentially, the promise of the future, the outlook that humans need to engage in action.

The problem of funding of educational change that is addressed in this note in terms of an estimate concerning required resources can be posed in terms of two questions. *What will pump energy into a reform program in amounts sufficient for its function and growth over a long time? Where is the future to come from?*

### III. PRELIMINARIES

In order to carry out the calculation, one has to name the providers and users of the resources. One has to explain why the resources will flow in the desired direction, and why the flow will be sustained. The stress is put on the condition that “the flow of resources in the desired direction will be sustained.” The calculation should tell the prospective participants in a reform project to what extent the promise of the future in it is realistic and why. The essence of the calculation is that it predicts a measurable number, i.e., the promise of the future is expressed in terms of a number that can be verified by comparison with data as the project develops.

Here is the central hypothesis of the calculation. *The ultimate inflow of energy to the educational reform program comes from parents and students.*

This is meant literally. The parents and students are the living organisms that gather energy from the environment and they bring it to the reform program to sustain its function, growth, and improvement.

Parents pay in more than one way, and students borrow against their future work to pay for services they receive. Essentially, in the estimate described here, parents and students enable teachers financially to hire experts who can help them improve teaching. The improvement in teachers performance is the mechanism of reform in which systemic changes are created by teachers on the basis of their increased awareness, knowledge, and understanding of the value that they bring to the students and their parents. They want to bring this value to them ever more productively as they themselves learn more and thus know and understand better and better what

they are actually doing.

The necessary condition for the sustained inflow of energy from parents and students to teachers for the purpose of hiring experts who qualify for helping teachers in advanced studies and improvement of teaching is that the inflow proceeds along a clear path from clients to the providers. Otherwise, there will be wasteful activities growing around the program. This is how the parasites live. To prevent the growth of unnecessary activities, the transparency of the resource flow must be constantly protected. For example, the transparency prevents excessive bureaucracy and profit seekers from becoming a burden on a reform program. Transparency secures such prevention because the parasites cannot clearly justify their participation in true learning and teaching processes; unclear arguments can be identified and rejected.

#### **A. Why teachers would want to work with experts**

True teachers are learners themselves. They desire to know, understand, and achieve more than they already do. They understand that their own growth is the basis of their ability to set example and thus encourage their students to grow and help them to grow. In addition, if they have a chance to participate in building a system in which their competence as teachers is rewarded, they can be expected to want to participate. On the basis of social studies one may expect that about half of teachers may be inclined and a smaller fraction may be eager to participate in educational research and development activities.

#### **B. Parents can decide to pay for help of experts**

Most parents think that their children need to learn in order to achieve happiness in life. However, not all parents are thinking about their children's lives in terms of discovery of what one's cup of tea is and how to drink it. Typically, parents know their own life and they wish their children to do better. Regarding teachers, parents remember a teacher or two who were helpful to them in school. Once parents are informed about how and why and with what results experts can help teachers increase their competence, they have a chance to compare whom they had and whom their children may have as teachers. On this basis, they can decide to pay.

#### **C. Can parents currently buy learning?**

The question is whether parents can buy high-quality teaching services for their children from typical teachers in typical public schools (of all levels). Typically, the answer is no, they cannot. Moreover, the concept of a public school in the current system is based on the assumption that parents do not and can not pay directly

to the teachers. Instead, they pay taxes and the taxes are redistributed by the government, only part ending up in the public education system. For example, currently about 40% of local income taxes in Poland is at the discretion of a local government. In unprivileged areas even up to 80% of this amount may have to be spent on schools to merely sustain their operation (in Warsaw, Poland schools consume about a quarter of the city budget).

The quality of service to students that is bought using the public money is not easily verifiable. The teachers' income in public schools does not directly depend on the quality of their services. It is not clear to what extent the members of a government system understand what members of the educational system are doing or could be doing differently. Parents have no alternative to governmental distribution of public funds for supporting advanced learning by teachers and thus they have no direct way to influence the extent of opportunities of their children to learn under guidance of the teachers.

#### **D. Are parents satisfied?**

Unfortunately, most educational systems fail to provide what parents want and expect for their children. The failure is not necessarily obvious to the parents or fully consciously realized by them. They may know that something is wrong when they see that their children are not excited about going to school, and when their children's outlook for the future does not appear bright for some reason, such as low grades and limited prospects of employment. But the parents may still think that the school is alright and the problem instead is with their children. With such conclusion, they see no way out of the situation and feel forced to accept it.

Even if parents feel that the situation could be better than it is, they may not know what to do about it. They also do not know how to do anything so that their children would benefit from their action rather than lose. For example, parents may be afraid of speaking up. Reasons may include a fear that their child will suffer consequences if they say too much. Also, a parent may feel insufficiently educated to have a say in the matter.

#### **E. What can parents do?**

One thing parents can certainly help with is providing for advanced education of teachers. Payment for the education of teachers can be arranged according to different rules than payments for education of children. Advanced education of teachers does not have to be for free and can be supported by parents according to the rules they will choose to accept.

## F. Whom could parents pay?

The question is whom the parents could pay for achieving on a regular basis that their children receive from their teachers the help in learning precisely as they need it. It is assumed that parents would pay experts who have a known record of helping teachers in this spirit. For brevity, we call such people experts-in-demand.

To provide some payment on a regular basis, parents would have to be convinced that the experts-in-demand whose services they pay for actually know and understand what kind of help children need and, even more importantly, that the experts know and understand how teachers need to learn as adults in order to become able to provide the help children need. For example, great teachers understand that their duty is to help children discover and develop their strengths in the course of acquiring and using their learning skills. Teachers need to do the same at their level of competence, both in the teaching as their profession and in subject matters they specialize in.

Existing experts-in-demand need to be identified and new such experts need to be educated. Parents can help in this process, too, by paying for services of the already identified experts-in-demand. The experts can take care of education of their own kind using the funds obtained from parents. Thus, the ultimate role of investors in the reform process belongs to parents and students. They, as the investors, seek ways to verify if their investment leads to expected results. Such verification is a duty of an investor.

## G. Is learning in a curriculum?

What the children need most is to become competent learners who know how to develop and utilize their strengths, taking advantage of and improving their knowledge, understanding and skills in agreement with fundamental values of human life. This goal of teaching is not contained in the practice of contemporary education of teachers as a foundation of the system. Teacher-proof curricula of schooling are not centered on the development of a student as a person. So, a typical teacher-preparation curriculum and on-the-job learning do not allow a misguided teacher to become a great one. To become a great teacher, a candidate must not only know the subject matter extremely well, which is rare, but also understand what it means to help students in true studies, which is still rarer. The amount of deliberate practice required for becoming a great teacher is much greater than teachers typically have.

So, to begin a serious reform effort, even if only in a very small way, one needs a team of properly prepared experts in various disciplines. The experts must not only know their disciplines but also understand what it means to help a teacher in studying, practicing and eventually becoming a great teacher. These experts may initially

collaborate only with the pre-selected teachers who already know that and understand why they need to improve their expertise in the disciplines in the context of which they teach students. In the course of this collaboration, teachers have a chance to learn what it means to have a true coach in improving one's strength in the process of studying, working in a team, producing results, and thus building one's system of values, knowledge and skills. Practicing such coaching with students teaches a teacher how to take advantage of real-life situations as contexts of productive learning. Such real-life situations are precisely the basis of learning practiced by scientists, artists, and professionals.

The experts-in-demand have pressing questions of their own concern regarding their work with teachers. This means that they are involved in research on ways to improve teaching together with teachers. Such research is by no means easy. The reform program must develop collaboration teams including experts-in-demand and teachers. The results of work of these teams must be visible to parents in terms of a clear change in behavior of children taught by the teachers, if the parents are to support such work. Examples that illustrate how this may happen are rare. Some preliminary cases and hypothesis concerning mechanisms of how they could be expanded to larger scales will be provided elsewhere.

## H. How much parents can pay

Parents are not going to pay a lot of money for education of teachers in the school where their children go to. They are also not going to start paying sufficiently in advance for educating the particular teacher who might later provide learning opportunities to their children. However, one may assume that parents can be prepared to pay a little bit for improvement of teachers in the school their kids go to, or will go to, if it is clear and clearly verifiable what they would be paying for. This assumption is likely to be true because people are known to contribute little amounts to causes they appreciate. For example, people certainly appreciate opportunities for improving life in the neighborhood where their life interests are located, and good schools are recognized as magnets of quality.

In addition, the act of payment, even if the amount is small, is a form of a real involvement in school matters. It engages much more than the actual expenditure of money itself. It gives a new right to a parent as a giver. A parent will feel entitled to ask "What did I pay for?" Such situational design changes a private parent to a shareholder in the enterprise of educating new generations in a concrete setting.

The actual amount will be estimated below.

## I. How students can contribute

Students do not have to contribute money. Students can make the process of teaching infinitely easier and more productive if they want to learn, instead of being forced to pretend learning and pass tests. The wanting is stimulated by exciting their curiosity and other natural features that students possess as extremely dynamic beings in rapid development.

Senior students can help in teaching junior students. This summit of productive learning and teaching methodology certainly requires expertise in coaching. Such coaching is familiar in the concept of scouting and it is not clear why such coaching is not a commonplace in schools. The help of students in educating students is probably the greatest, most promising and least effectively used resource of meaningful education. In contrast to practice of today, the great teachers of tomorrow will probably notoriously be using this resource with ease.

Students can also help in running schools and free teachers from mundane functions that do not actually require involvement of advanced adults. Such practices of delegation of responsibility are also known in scouting organizations. By analogy with scouting, students can engage in learning while they do all kinds of helpful work that otherwise would have to be done by teachers and other adults. Consequently, if involvement of students led to lowering the cost of running a school, there would be more resources available from the public coffers for students, teachers, and the experts-in-demand. In particular, teachers would have more time for advanced learning and improvement of teaching.

## J. How parents can avoid wasting money

The teachers who have the opportunity to work with experts-in-demand would know who pays for it. Their advanced education through such collaboration should include practice in productive communication with parents and allowing parents to understand what happens. However, parents can also judge themselves if the funds they provide are properly used on the basis of observing their children. Parents may regularly inquire about the opinions of students concerning performance of teachers.

The experts-in-demand are hired because they offer a high probability that as a result of working with them the teachers will achieve specific changes in classroom regularities. The experts also propose and help organize activities outside classrooms. Parents can observe if these activities materialize in the improvements of school functioning using explicit statements made by children at home and, more generally, outside school, i.e., outside the supervision of their teachers. The actual rules of accountability can be discussed between teachers and parents as they decide to hire experts-in-demand.

## K. Need for small trials

The idea of parents supporting productive education of teachers needs verification. Such verification can only be gradual, starting from small projects. But even a small project needs an estimate of its outlook on the future. The estimate described in the next section is based on the assumption that small projects will spontaneously create enough spirit of performance to form an *organization* in which students, parents, teachers, and experts-in-demand will be able to perform in a systematic way.

Many initial attempts at small scales will fail. Every such failed attempt will contribute information about what does not work, if the case is recorded. If many cases are recorded, the information will allow participants to filter out elements that do work from a sea of inevitable mistakes. Therefore, even the smallest, initial projects should keep records of their action and results.

It is imperative not to waste resources on large projects that are not sufficiently tried out at small scales. Also, scaling up of every small successful project will face its own new problems that will require identification and solution.

## IV. CALCULATION

The calculation described below is just an example that allows one to see the orders of magnitude that are potentially involved in the matter, provided that the system of parents supporting advanced education of teachers turns out to work as assumed. The orders of magnitude used as input data are realistic for Poland. In other countries, and for specific schools and areas that depart from the average values used in the estimate, some rescaling will be needed. The orders of magnitude are likely to be the same.

A similar calculation is required in every lasting educational project that is supposed to “do good and grow,” if reformers want to assess the chance that their project can lead to a qualitative change over time. For example, the fact that the Reading Recovery program [5] functions and grows suggests that more resources flow into the program than flow out.

The calculation described here is carried out in terms of money. Poland is used as example for using realistic numbers. Polish zloty is about 3 to 4 times smaller at current exchange rates than dollar and euro, but the average incomes and some basic expenses in Poland in terms of Polish currency are of the same order of magnitude as the average American and European incomes and expenses are in terms of dollars and euro, albeit for some basic goods the differences are not negligible. Since dollar and euro are roughly the same in comparison to Polish zloty (1 euro  $\sim$  1.3 \$ in 2012), the currency units are omitted.

That the calculation is carried out using money is not essential. What counts is the identification of the source

and magnitude of inflow of energy, of which money is treated as an indirect but useful measure.

There are options mentioned in the estimate for significant contributions from the common tax money, in addition to the funds put in by parents. Such significant tax-based support is expected to eventually become a regularity as a result of voting by parents as citizens in a democratic country. Such result would indicate that the reform program achieves a qualitative change.

#### A. Example of initial assumptions

Suppose there is a high school that has 300 students, see Table I. For larger and smaller schools, one has to properly rescale the numbers that follow. The number 300 corresponds to the average size of a high school in Poland according to the Polish government statistical data from 2011. This corresponds to 100 students at each grade level, if there are 3 grades in a high school as it currently is in Poland. Let us assume that there are 100 students per grade anyway. Polish primary schools are on average about twice smaller than the average high school, and the middle schools are on average in between.

On average, there are about 25 teachers per high school in Poland. 25 teachers per 300 students means about 8 teachers per 100 students. It cannot be exactly right, but let us assume that 10 teachers specialize in sciences, 10 in humanities, and 5 in mathematics. This assumption will yield sufficiently informative estimates of the orders of magnitude. One can use these estimates for considering specific departures from the assumed distribution of specialties among teachers.

Let each of these teachers personally interact with 100 students every year. For example, if 5 mathematicians teach 300 students then each must on average regularly interact with 60 students. But if there are only 2 physicists in the faculty, each must be in regular contact with 150 students. 100 appears a reasonable compromise between 60 and 150.

TABLE I: **Numbers per high school**

There are on the order of 2000 high schools in Poland and 3 times as many middle and 7 times as many primary schools.

students	300
students per grade	100
teachers per school	25
students per teacher	12
science teachers	10
humanities teachers	10
other teachers	5
teachers educated/year	2
students influenced/educated teacher	150
number of parents who pay/child	1 (not 2)
number of units paid per month	10
number of months	12
total units paid/year	36000
units paid/teacher/year	18000

Suppose that out of the 10 science teachers only 2 per year work with the experts-in-demand in an extensive program that is proven useful for the purpose or reforming education with parents involved in covering the cost of such collaboration (see below).

The number of teachers in the program is assumed to be only 2 per school because the program is expensive and the smaller the number the smaller the burden for parents. But the number of teachers per year cannot be smaller than 2 per school because they need to support each other in solving problems they encounter in their school.

The collaboration with experts-in-demand does not take a teacher out of her or his school. Instead, the experts-in-demand provide help on-site or in a nearby location to which the 2 teachers can easily commute within a working day at least once a week.

The two teachers who receive this special opportunity are assumed to understand and appreciate it that they belong to the team of faculty in their school and that their professional goal is to share what they learn while they serve the students in their school and communicate with other teachers. These teachers are assumed to want to grow personally as professionals in their trade.

Assume that more teachers in the school rotate over years as collaborators with experts-in-demand at increasing levels of sophistication. The better and more evident the results of such collaboration year after year the more teachers of the same faculty team want to participate in working with the same group of experts-in-demand. So, assume that the 2 trained teachers share what they learn among all 10 science teachers in their school. Their new experience includes ideas and practice of how to share what they learn with faculty members in their school. These assumptions mean that the advanced education of one teacher a year influences education of more than 100 students a year because teachers learn from each other on the job and mutually improve their teaching.

In order to make the order-of-magnitude estimates, one can assume that advanced studies by one science teacher a year serves improvement of education of 150 students a year. If the advanced study program indeed improves the performance of teachers, the whole school benefits.

#### B. Informing parents

Informing parents about the changes that occur in school practice as a result of the advanced studies, especially when the changes touch the roots of school culture, is very important locally. Informed parents have a chance to understand that if they contribute to the advanced studies of just two teachers a year then the whole school, including their own children, benefits in many ways. The indicators of success and profitability of investment that parents can monitor include: changes in the behavior of children, content and form of communication between parents and teachers, and quality of



activities that children participate in and outside school and describe to parents at home. One of the perceptible effects is the excitement about future that results from concrete events, such as a completion of an inspiring task by a group of students, a result worth thinking and talking about. For example, as far as teaching in the context of science is concerned, students may go on a research trip arranged according to the plan that they and their teachers design in collaboration with experts-in-demand.

### C. Cost per teacher per year

The chain of interdependent factors described in previous sections leads to the assumption that parents of 150 students (half of our model school population) may cover the cost of advanced studies of one teacher per year in collaboration with experts-in-demand. Parents of one student may pay just a little bit. All parents of all students in our model school (300 students) may thus support advanced education of two teachers per year.

How much could a father or a mother pay per year for the purpose of improving the teaching standards of the school their child goes to? If they paid just 1 unit of local currency per month, they would pay 12 units a year. If they paid 10 units per month, they would pay 120 units per year. When the latter is multiplied by 300 (the number of students in the school), the budget for advanced studies by two teachers per year turns out to be 36 thousand, which means 18 thousand per teacher per year. This amount is comparable to tuitions in respectable public colleges.

The parental support means that the regular school budget remains untouched despite that new quality is flowing in into the school operation. The increase in quality is correlated with the parental involvement, transparency of funding for advanced learning of teachers, and confidence of purpose that fuels the spirit of performance in teaching students for the entire school faculty.

Some parents may not like the idea of paying even if it is only 10 units of currency per month. But some may be ready to pay more. The fact that the issues of payment for improvement of teaching quality may be discussed and acted upon is here assumed to have positive consequences for the school community.

In any case, the assumptions made above amount to one parent per child paying 10 currency units per month. One might also assume in many cases that two parents could pay such amount per child. This would result in the increase of estimated funds by factor 2. Thus, assuming only one parent per child pays may be underestimating the inflow of resources that parents may be willing to provide on regular basis. In the future, when they are convinced by the long-term record of concrete results, parents may not even think about questioning that it makes sense to provide support for advanced studies by teachers in collaboration with experts-in-demand.

### D. Where does the tuition go

Suppose the tuition for advanced education of a teacher goes from parents of students in a school directly to a special company. Let us call this company a Teachers Center (or TC). The TC is formed by the experts-in-demand. One can think about TC in terms of an analogy with a medical research group formed by all kinds of experts who unite in effort of helping doctors improve their services to patients.

### E. Comment concerning the goal of TC

It is essential that the advanced studies by teachers in collaboration with the experts-in-demand who form a TC has a clear, overarching goal. *The central task of a Teachers Center is to build, use, improve, and share the concepts of productive learning and productive teaching among teachers and professionals and through them and their students in the whole society.* Unless a TC performs this task, it loses sense as an enterprise. However, it is not relevant what its central task is for the purpose of just crunching the numbers and estimating the resources that parents of students in schools in the neighborhood may actually provide for supporting the TC that functions well.

The due explanation of advanced studies process for teachers is a difficult task that requires expertise. The key difficulty is to explain the concepts of productive learning and productive teaching. The explanation cannot be provided or comprehended using only words. Reading is not enough. A long-term commitment to study of theory and practice of learning and teaching in various contexts is required of a person who wants to understand what is involved.

The concepts of productive learning and teaching are not commonly recognized as such precisely because the society's concepts of education are built through experiences within the current system. This system is based on the idea that human minds can be filled with information at school like books that are printed in a printing shop. The idea of mind-printing is about four centuries old. It dates back to the invention of print and educational system design described by Comenius. Today, the printed book is being replaced by interactive technologies. With their help, humans can emancipate their learning from the regime of teaching based on the concept of printing. But it does not mean that the concepts of productive learning and teaching that are essentially interactive become broadly recognized right away as a result of emergence of new technologies. In the case of printing, nearly two centuries passed between the invention in technology (Gutenberg around 1450) and a conceptual design of a new educational system that works in analogous ways (Comenius around 1650).

The lack of shared concepts of productive learning and teaching is the actual reason for this article. Namely, the

estimate is provided for the purpose of indicating that a continuous, interactive reform process, capable of leading eventually to a situation in which a short document on the principles of productive learning and teaching could be considered clear by a majority of readers educated by a universal public system, can be initiated by teachers, sustained by parents, and helped by experts-in-demand.

#### F. Crunching numbers for a TC

Let a TC work with about 100 teachers at a time. Two teachers per school means that a TC serves 50 schools. In Polish realities, where there are 16 provinces (16 wojówództw) and on average 125 high schools per province, this means that there are 2 to 3 such parent-supported TCs per province. If all high schools in Poland were served and every TC served 50 schools, one would have about 40 TCs in the country. Our estimate calculation begins with these numbers (see Table II).

The TC budget that originates directly from the pockets of parents is estimated as 100 times 18 thousand, which amounts to about 1,800,000 a year. It is thus not entirely out of order to assume that a TC can operate in a stable fashion.

A TC that is widely recognized for its verified utility to teachers and thus students in schools, is expected to be capable of obtaining a share of tax money. There can be matching funds from the local government. There can also be matching funds from the central government in support of the local government for this purpose.

In addition, it is also possible that private donors contribute. This possibility includes not only the local citizens and employers, but also outside investors and buyers who are interested in patterns and sources of educational solutions that apply on a much wider scale than only locally. A TC may publish and sell its expertise for a hefty fee.

If the additional sources contribute to the inflow of support, the total TC budget may climb to twice or even thrice the amount provided by local parents alone, i.e., it may grow to 3,600,000 or even 5,400,000. This does not include yet professional grants that may be awarded to a TC for specific projects.

#### G. TC productivity

A TC that serves a community of 50 schools of 300 students each serves 15,000 students a year. After 10 years, the TC could have served 1000 year-teachers, most likely many of the teachers being involved in a year of advanced collaboration with experts-in-demand more than once, i.e., in a sequence of gradually increasing levels of competence in learning and teaching. As a result, the TC appears to have a chance of producing at least 100 great teachers in 10 years. The number 100 is obtained if one and the same group of 100 teachers collaborates with a TC over the whole period of 10 years. If more teachers are involved, the resulting number of great teachers may be greater than 100 per 10 years.

If there are only a bit more than twice the number of TCs than provinces in Poland, say 40, after 10 years of operation there could be at least 4000 great teachers in high schools around the country, including and in addition to the ones who already work there. Since there are about 50 thousand teachers in high schools in Poland, the 4000 would amount to about 8% of all teachers. Thus, one can estimate that after 30 years at least about a quarter of all high school teachers would be the great ones, fully conscious of the value of their services to society and capable of expressing their competent opinions concerning educational reforms. These teachers would also be capable of forming a strong professional organization of the kind that teachers cannot currently form, even if they are great. Such strong, self-conscious professional organization could double its membership faster than in 10 years.

TABLE II: Estimates for Teachers Centers (TC).

number of teachers served/TC/year	100
number of schools served/year	50
number of TCs per province	2-3
tuition collectable per TC/year	1.8 mln
budget including matching funds/year	ca 3-5 mln
number of students served/TC/year	15000
number of great teachers/TC/10 years	$\gtrsim 100$
number of great teachers/all TCs/10 years	4000
% of great high school teachers after 10 years/Poland	8%
% of great high school teachers after 30 years/Poland	24%
number of staff members/TC	18
units inflow per staff member (conserv.)	$\sim 100,000$
units inflow per staff member (optimist.)	$\sim 300,000$
number of schools served/employee	16-17
number of schools served/day/employee	3-4
number of teachers served/day/employee	6-8

#### H. Funds per TC employee

Suppose a TC has a budget of only 1,800,000 currency units, which means that there are no matching funds, donations, sales, or grants. How many staff members could a TC have? If it had only 18 permanent staff members, such as 3 great teachers of whom one is the TC director, 5 mathematicians, 3 physicists, 3 chemists, 3 biologists, and 1 properly prepared person for administration, there would be 100,000 units of currency flowing in per year per employee to cover their salaries, benefits, and overhead. This is a conservative estimate.

If there is a few times larger budget, the numbers change. In a well-performing TC, there may be more permanent staff members, they may earn more per hour, and there may be funds for more equipment and travel

for study. The factor 3 being not unthinkable, as indicated above assuming tax money, donations, sales, and grants, one can consider an optimistic estimate of 300 thousand a year of TC funds available per employee in the area of science.

Some of the numbers would double in an estimate including humanities. The doubling would require 20 units paid per month by one parent per child, or 10 units paid by two parents each per child. The essential benefit in the case of Poland would be, however, that in 30 years the great teachers in Polish high schools would form about 50% of all high school teachers. The period of 30 years is not even 10% of the time over which the current system developed since Comenius offered his design.

If the TC system worked also for primary and middle schools, it would form a major force of change in the hands of parents, teachers, and experts.

### I. TC workload estimate

Can 3 experts-in-demand who specialize in physics serve 50 schools productively? One of them would have to serve about 16-17 schools. This means 3 to 4 schools a day during 5 working days of the week. But if in each school only 2 teachers are participating, there are only about 6 to 8 people to interact with per expert-in-demand per working day. Still, every one of these experts would have to have extraordinary knowledge and skills in order to perform the required tasks of assisting and coaching 6 to 8 teachers a day.

In the demanding scenario of 6-8 teachers per expert-in-demand per day, there would of course emerge problems of logistics. But the schools may cooperate. On one day one group of 6-8 teachers may meet in one school, and on another day another group may meet in another school.

On the one hand, the logistics may appear as a big problem. On the other hand, it provides a great opportunity for the teachers of one school to learn about what happens in other schools. Teachers may develop their inventiveness and entrepreneurial attitudes in a collaboration that requires solving problems of logistics. The contacts necessary for solving the logistics problems may evolve in time into voluntary engagements and commitments that accelerate sharing of the concepts of productive learning and teaching, rooted in real-life contexts.

## V. FORMATION OF A TC

Since the experts-in-demand are hard to find, the staff of a TC would have to be completed in a careful process of selection. The selection starts with identifying the first director, an actual founder of a new TC.

### A. The TC director

The director would have to be a great teacher who deeply understands the concepts of productive learning and teaching in theory and practice, is recognized as a great teacher by other teachers, qualifies in terms of competence and integrity as a manager and a leader, wants to create the profession of teaching, and is prepared for the creation of a working TC to take a lot of effort and time.

The director's most important first task include identifying the teachers who want to form the TC and finding the expert- or experts-in-demand who can provide the initial help the director knows to be truly needed by the teachers in her or his school. Personal contacts between the director, teachers and experts-in-demand will form the foundation for further steps because nearly all these steps require personal safety and trust. The first tasks also include convincing the initial group of teachers in a school that inviting some expert-in-demand can help in solving the problems that the teachers face. The group of convinced teachers can subsequently appeal to parents for providing the minimal necessary amount of funds that are sufficient to cover the cost of first visit or visits by the identified expert or experts.

Another mandatory task in the initial activity is to keep a record of events and their results, including results of the teachers-experts collaboration. The record will be a key to demonstrate in terms of description of facts that the teachers-experts collaboration is productive. For example, one can record new elements in teacher-student conversations, new features in the behavior of students, new decisions of teachers regarding their classroom work, and reports of parents on changes in behavior of students outside school.

### B. After-school laboratory

The director must respect systemic constraints on the school functioning. Thus, opportunities for experimentation by a teacher and an expert-in-demand exist in the form of an after-school program that they can design, create and run together with students. The after-school program is a source of new ideas about what and how can be improved in working with students, also in the regular classroom. A separate document will discuss the key role that a school-based scouting organization can play in this context.

Since this note is focused on the estimate of cost of reform to parents, the key question of how scouting differs from Comenian-like school based on analogy with printing is not discussed here in any detail, except for a few comments below. In particular, it is essential to avoid the impression that the after-school educational laboratory programs that draw on the concept of scouting can be thought about as childish. Three examples are invoked here to stress how important the scouting principles are.

They concern fundamental issues of the role of productive learning and teaching in functioning of democracy and improving the quality of life of people.

The first example to mention here concerns the tradition of Polish scouting, documented in many publications of which only three are quoted here [7–9]. These books are available in Polish. Their existence only in Polish illustrates the need for creating an international organization that is capable of employing educational resources available from different peoples in different languages. The books make it clear that the concepts of scouting adopted in Polish culture in 20th century on the basis of struggle for freedom and democracy at least since 18th century led to the creation of a great organization that provided Polish youth with values and wisdom they later used as adults, recently in overcoming communism and during most recent decades in developing a free society.

The second example is provided by the Girl Scouts of the USA, essentially captured by Frances Hesselbein in her book *My Life in Leadership* [10]. Hesselbein demonstrates the seriousness of issues that scouting is concerned with in the US. She also describes the examples of recognition of values of scouting principles and educational methods among leaders of the American people. This recognition exhibits itself in the existence of Leadership Institute [11].

The third, fundamental reference concerning the laboratory for advanced studies by teachers according to our estimate, is provided by Peter F. Drucker [12]. In a discussion with Albert Shanker, former president of the American Federation of Teachers, Drucker stresses the importance of foundation of achievement, which requires high-quality education needed by independent knowledge workers. Shanker points out how productively he learned in a process of earning merit badges when he was in Boy Scouts. The point concerning the estimate described here is that parents can help in joining the two ideas: one of the required competence that is stressed by Drucker and the other one of how one actually achieves competence that is stressed by Shanker, by supporting creation and functioning of TCs in which teachers can study the variety of issues that matter in teaching a person and where they can interact with students in ways akin to best tradition of leadership in scouting.

An after-school program allows the teacher to develop and experiment with her or his ideas and apply them as they develop in collaboration with the expert-in-demand and students. The key aspect of the after-school program in this context is that the teacher and the expert-in-demand can engage in the process of advanced learning about students in ways that are free from pressure of the existing educational system. In other words, they can focus on questions concerning the unknown, the unclear, the difficult, the never-understood, and the always-suppressed because of all kinds of fears.

In particular, the fears stem from the low self-esteem and uncertainty about personal status, especially when a teacher is aware of loopholes in her or his comprehension

of the world and may easily be accused of lack of familiarity with the depth of knowledge and degree of understanding that are necessary for being a teacher. One's comprehension of the world and familiarity with knowledge and understanding of it that is currently available to humanity is the actual basis of what a teacher can truly do to help her or his students in becoming learners. The informal after-school laboratory allows all participants to ask the questions that they are afraid to ask in the formal system setting where they can be unfavorably judged if they disclose blanks in their knowledge, loopholes in understanding, or shortcomings in skill.

The after-school format allows students to pursue their interests in forms that are not acceptable in the current educational systems, such as field studies over extended periods of time far away from the school building and according to the wishes and ideas of students rather than teachers who must comply with the curriculum and schedule imposed from above. A teacher who is capable of earning the trust of students to the extent that allows her or him to naturally participate and observe students in such activities, is extraordinary rare in the current systems. In the reform program that exploits the opportunities offered by the after-school programs which take advantage of learning principles employed in scouting, such teachers would be the leaders.

### C. Initiative in the hands of teachers

The initial group of teachers may proceed with increasing the number of hours of interaction with experts-in-demand provided that they are funded by parents on the basis of the results that teachers obtain with students, results clearly demonstrated to parents. Thus the process of formation of a TC is essentially based on the will and competence of the founding teachers. It is never imposed on them in any form from above.

Unless the initiative comes from the depths of hearts and minds of teachers and is met with competence of experts-in-demand so that the results of their collaboration are clearly recorded, the TC will not create a solid, documented base for its long-term development with support from parents and thus will not provide the full impetus it could to any wider reform effort.

The teachers have to consciously tackle the problem of identifying experts who can understand the goal of forming a TC sufficiently well for making a reliable commitment to helping founders of a TC in solving subject-matter problems that require advanced studies. For example, the founders of a science TC would have to arrange voluntary agreements with mathematicians, physicists, chemists, biologists, etc., who would be able to provide help of the kind needed by great teachers and by candidates for great teachers. This includes help in learning about the mechanisms of progress in the disciplines that teachers study. These mechanisms typically involve a host of features that are essential in productive

learning and teaching.

Undoubtedly, the group of teachers would immediately face many foreseeable and unforeseeable problems. Their chance for success would depend on the number of teachers in the founding group and the strength of their desire for growth and advanced learning in collaboration with scientists, artists and professionals who collaborate with them as the experts-in-demand.

#### **D. Pedagogy and andragogy**

The teacher founders of a TC would have to be in touch with the experts on pedagogy and andragogy (one can learn about the latter following attempts of Malcolm Knowles). These experts would have to be competent enough to advise both the teachers and experts-in-demand on the issues that emerge on the way toward productive functioning of a TC.

Voluntary engagements in the area of pedagogy and andragogy could be supplemented with special projects that obtain funding in the form of grants for definite research purposes. Such research would be of interest to professionals. Therefore, the professionals would want to carry out research concerning the formation and functioning of a TC. This subject may actually become a new area of research in pedagogy, andragogy, and many other disciplines in social sciences anyway.

The service of professionals to a TC could be recognized in their home institutions as a part of the duties that professionals are expected to fulfill as members of society. Such services build the status of social responsibility for their home institutions.

#### **E. Self-selection of founders**

Most importantly, however, a formation of a TC needs founders who can function as leaders. Such founders can currently only self-select. This note is supposed to help the potential leaders to self-select.

A natural step of self-selection for a founder of a TC would be to contact the author with a suggestion of what step or steps the founder would like to make toward creation of a TC. A realistic suggestion could provide a basis for discussion on how to go about making these steps.

The above comments apply to the stage of creating first TCs. The ones that survive the initial phase and grow would become sources of insight concerning how to form new ones.

#### **F. TC location and operation**

Where would the TC be located? This is particularly interesting and important question for this note. The old paradigm of a center is a building where people assemble for some purpose, like in a biggest hut in a village. Today,

electromagnetic and electronic means of telecommunication do not force us to think in the same terms. Thus, while a TC should be located somewhere in the middle of the 50 schools it serves for reasons to be explained below, the concept of the middle refers not merely to geography but to the center in the world of values, knowledge and skills that are relevant to the purpose of serving the school teachers whose students' parents support the TC.

The basic reason for geographic location of a TC in the middle of the area where the teachers it serves work and live is that such location makes it easy for the teachers to meet in the TC. However, one can also consider the concept of a virtual TC. Such virtual TC could secure easiness of personal interaction among teachers and experts-in-demand using the school premises where the teachers work. These buildings already exist and they are not fully utilized outside the times specified in the regular classroom schedules.

Currently, however, the function of a central hut in a village cannot be treated as marginal. For example, church buildings are erected for the purpose of assembling and uniting by like-minded people. The fact that a church building exists is providing people with a sense of stability of foundation of their conceptual frame of reference. It visibly confirms the commitment of the attending community to sustain the organizing function of this frame of reference.

Can a TC be built? If it is so decided by a sufficiently large number of teachers in sufficiently many schools, they may undertake efforts to secure the necessary resources. Parents are expected to help. Local governments may help with land, construction, and operation cost. After all, the teachers who are to use the building would teach the local kids. If the parents of these kids want that a TC has a building, the local governments can be expected to support their wish with funding, since otherwise they risk losing election.

On the other hand, a virtual TC may exist as an organization of teachers and experts-in-demand who do not need an entire building. Besides taking advantage of school facilities that already exist and can be used after school hours as necessary, teachers and experts-in-demand may also take advantage of telecommunication technologies (as they develop over time). In particular, the mode of working from their residences using efficient means of telecommunication is often the preferred mode of functioning by creators and independent thinkers. They can utilize cutting edge telecommunication technologies precisely as far as they can be helpful.

#### **G. Promise of the future**

The estimate described above provides the promise of the future to all stakeholders who engage in a project whose goal is formation, functioning, and continuous improvement of a TC as an element in an entire network of the TCs. Namely, for as long as there will be parents

and students, the estimate says, the future does not have to be questioned if the TCs serve their mission well.

Whether the TCs do or do not perform as needed is continuously verified by parents on the basis of how their children perform. This direct accountability scheme prevents the network from developing disparities and opportunities for abuse. The participants can react to indications of problems long before a pile of problems leads to a major malfunction.

## H. Initial action

What every teacher vitally interested in authentic educational change can do already next Monday is to start talking with other teachers and people of similar interests about how to begin building a local organization that will be able to identify and hire first experts-in-demand for working with local teachers on their problems. In the practice of a regular school, this means that teachers find a way to talk with parents and ask if the parents could support a visit of some expert.

A good way to talk appears to be to first demonstrate to parents on a small example the kind of benefits that such visit may bring. This is a subject for a thick book. Then, a carefully selected expert-in-demand can be proposed for invitation for a definite purpose that parents will understand. Since the cost is to be covered by parents, the expert-in-demand should be invited for the purpose of solving a particular problem which the teachers truly want to solve and about which the parents know it is acute, urgent, and not easy to solve.

For example, the problem may be that parents are poor and have no funds to support an excursion of students to a major place of interest, such as a science museum in a capital. If children earn a portion of the money that they need for the trip by doing useful work in their community, their thinking about money will change. Parents will certainly notice that their cost of providing for education of their children is lowered in an unexpected way. If the idea of proceeding this way and how to do it comes from an expert-in-demand, materializes in the hands of teachers, and parents know the results, they may be convinced by the group of founding teachers that it makes sense to provide resources needed to invite the expert-in-demand whom the teachers want to come to their school for a well-defined reason relevant to creation of a TC. The cost per parent may be small. Large direct monetary expenses can be avoided. Instead of paying for a room in an expensive hotel some parent may host the guest. Food may also be arranged not necessarily in an expensive restaurant, etc. If the expert lives nearby, the cost may be entirely negligible in comparison to the value of outcomes.

Another example of a serious problem is flooding, apparently local. Typically, the problem of flooding cannot be solved locally and requires a broad comprehension of its origin in order to figure out ways for seeking a so-

lution. In the course of learning how to deal with such serious problem, an expert-in-demand can play the role of an advisor to the teachers and parents about how to help children comprehend what actually happens, what needs to be done, and how to do it. The excitement about and desire for finding solutions may greatly influence how children learn and how they think about their future. The change will be visible to parents in terms of conversations the children will initiate with them at home and the conclusions children will openly come to regarding vital issues.

Still another example of a serious problem concerns informing parents about the difficulty of subjects of major interest that teachers are supposed to explain to students, such as what the place of humanity is in the universe, where nuclear power is coming from, how it was discovered, and how it can be used or misused, what we know about human brain and its development in evolution and in life of one person as it learns, etc. The problem is that the school has a mission of helping students learn about the world where they live. Parents may not fully realize the challenges that teachers face. A suitable program designed by teachers with participation of experts-in-demand may help parents recognize that teachers need competent help in teaching students. One way to explain this challenge to parents is to ask an expert-in-demand to come to a meeting with teachers and parents at their school and talk about it in the form of a lecture, a discussion, or some other activity that the teachers and experts can invent.

If a series of visits by experts with support of parents is successful, teachers may eventually identify experts worth an extended collaboration on issues of productive learning and teaching. This activity would allow teachers to obtain the initial evidence needed for appealing to parents for a sustained support and possibly a contribution to creation of a precursor of a future TC for a number of schools. The latter step would obviously require an intense, self-motivated collaboration of teachers from more than one school, a seldom found phenomenon in today's systems.

## VI. TC NETWORK NEEDS A BRAIN

Where could the assurance of wisdom and quality of a TC as a seed of change supported by parents come from? The point of the estimate described in this short note is not to explain the full answer to this fundamental question. The answer is only hinted at below after the following remark.

The purpose of estimate described in this note is to say that gradual creation of a new system does not appear hopeless, even if it is not easy and must take time. Namely, the estimate says that there is enough energy available in parents and students to create and sustain a whole Network of Teacher Centers (NTC). Employees of the NTC would work as scientists, artists, and other

professionals always do, except that their focus would include productive learning and teaching. There is no point in discussing how they would actually do it. This cannot be explained in words on a page or two. The readers interested in the issue will have found required elements already described in relevant literature.

However, there is one feature of the NTC that must be stressed immediately: *the NTC needs a brain.*

Mother Nature tells us that every advanced living organism has a brain. Similarly, the TCs cannot function in isolation from each other and from sources of power that drive society. The strength of their function must come from integration in a greater culture. The NTC needs a brain that enables it to constantly learn and hence maintain the society's support.

*The predictably dominant function of the NTC brain is to maintain, continuously improve, and guard the process of preparing great teachers, i.e., professionals who understand and excel in utilizing and improving the concepts of productive learning and teaching for the purpose of helping people become, generation after generation at all ages and levels of competence. The NTC brain constantly learns how to best perform its function.*

An example of a precursor of a required structure and function appears to exist in the form of Reading Recovery (RR), whose creation was greatly advanced by Marie Clay, an educational expert par excellence [5]. Marie Clay has carried out her research on difficulties children encounter when learning to read for nearly two decades in New Zealand. Later, the RR program matured enough to encourage people to implement it on a broader basis, far beyond New Zealand. RR operates now in the US and Europe. It was born having a learning brain.

There are at least two reasons for the NTC brain to be international. One is that no country has enough top expertise on every issue that the preparation of teachers involves. Another reason is that if the brain is not international, the organization will be prone to develop nationalistic attitudes that lead to disasters, such as wars or large, strong nations exploiting weaker, less educated and less resourceful ones.

Formation of a potent brain in the head of a meaningful reform program for education is the challenge of highest intellectual caliber imaginable, at all levels. The challenge is by no means limited to educational institutions because it extends to major professional organizations from which the experts-in-demand originate.

## VII. CONCLUSION

The principle of parents helping to take care of educational reform by supporting advanced learning by teachers has apparently never been consciously applied in educational reform on a global scale. Nothing is known to the author about its feasibility on such scale. The global system may only emerge from trials and collaboration of many small projects and only if they succeed in

finding ways and means for a broad collaboration. The hope is certainly associated with students who receive the new kind of preparation and take over the duties of great teachers and experts-in-demand in carrying the process of change on from generation to generation.

Small or large, independent educational projects will not necessarily be welcome. It is likely that creation of NTC supported by parents will be opposed by people who lack the required insight. For example, the excessive bureaucracy in systems where parents have no real role to play is likely to consider the idea as threatening and counterproductive. The bureaucracy cannot be blamed for thinking this way since they were not involved in deciding what kind of an educational system molded their minds. But their deeply rooted resistance must be taken into account in planning.

The principle of parental support for advanced studies by teachers is also likely to be rejected by those who see themselves as capable of and thus *entitled* to taking advantage of resources of our world without much of a thought about where the resources they use actually come from and without acknowledging that they use these resources at the expense of others who are less lucky and do not realize what happens. For example, this is how members of strictly profit-oriented and corrupt organizations may be expected to respond.

Organizations that exploit others by operating from their privileged position and taking advantage of ignorance of the exploited will find the concept of NTC particularly dangerous. Namely, some parents may recognize and understand when youth is being exploited. If these parents secure through their support of contacts between teachers and independent thinkers that the teachers learn what happens and explain it to students, the exploiters will not be able to continue their practices of taking advantage of the ignorance and naivety of youth.

One also needs to prepare for the difficulties associated with creative destruction that a new approach always faces in the process of replacing less productive approaches. Practitioners of the latter will fight for survival. The fight for survival means that they will use any means they can to avoid defeat in competition for the parental support.

The optimistic aspect of the estimate described in this note is that it does not require everybody to perfectly understand and agree on everything in advance. People can start supporting the process of change by small steps, such as just one school using funds provided by parents to hire one or two experts to help just one team of teachers, etc. The estimated costs of the small startups to parents appear surprisingly low in comparison to the value they are capable of providing.

## Acknowledgment

Among many people who influenced his thinking, the author gratefully acknowledges many illuminating discussions with Seymour Sarason concerning the nature of human learning and formation of settings (Seymour died in 2010). The author also greatly benefited from multiple discussions with Kenneth Wilson concerning learning and systemic issues in the context of physical sciences, Reading Recovery, and the conceptual legacy of Peter Drucker. In addition, the author thanks Andrzej Janowski for his work on creating and running the youth organization called 1 WDH “Czarna Jedyńska” that influenced the author in his youth (and for posing stimulating questions concerning the lessons drawn by the author from the concepts and practices of that organization much later).

TABLE III: Statistics of Polish schools in 2011 [6].

primary schools (6-13)	14000
middle schools (13-16)	7000
high schools (16-19)	2000
colleges and universities	400
high schools/province	125
teachers of primary schools	176000
teachers of middle schools	109000
teachers of high schools	50000
students of primary schools	2200000
students of middle schools	1300000
students of high schools	630000
students/primary school	160
students/middle school	186
students/high school	315
students/teacher in primary	15
students/teacher in middle	13
students/teacher in high	12
teachers/primary school	13
teachers/middle school	16
teachers/high school	25
average teacher income/month	3400
teacher work cost/hr	42
estimated number of hrs/month	80

- 
- [1] S. D. Głazek, *The Living Network of Schools Owned by Teachers and Students*, <http://arXiv:physics/9804005>.
- [2] S. D. Głazek and S. B. Sarason, *Productive Learning: Science, Art, and Einstein's Relativity in Educational Reform*, (Corwin Press, 2006).
- [3] S. D. Głazek, *Heuristic Model of Teaching*, <http://arxiv.org/abs/0804.4796>.
- [4] M. Ekiel-Jezewska, <http://www.ippt.pan.pl/~mekiel/EDU/CN/prezentacja20070122.ppt>, in Polish.
- [5] <http://www.readingrecovery.org/>.
- [6] [http://www.stat.gov.pl/gus/5840\\_737\\_PLK\\_HTML.htm](http://www.stat.gov.pl/gus/5840_737_PLK_HTML.htm) See also Table III.
- [7] B. Wachowicz, *Kamyk na szafcu: Gawęda o druhu Aleksandrze Kamińskim w stulecie urodzin* (Rytm, 2002); in Polish.
- [8] A. Janowski, *Być dzielnym i umieć się różnić: Szkice o Aleksandrze Kamińskim*, Wyd. III (Warszawa, 2010); in Polish.
- [9] A. Kaminski, *Nauczanie i wychowanie metodą harcerską* (Warszawa, 1948); in Polish.
- [10] F. Hesselbein, *My Life in Leadership* (Jossey-Bass, 2011).
- [11] <http://www.hesselbeininstitute.org>
- [12] P. F. Drucker, *Managing The Non-Profit Organization: Princiles and Practices* (Harper Business, 1990), see pp. 131-138. Other Drucker's work on management and key aspects of social responsibility is essential to every reasonable reform program in education and must be consulted as well.